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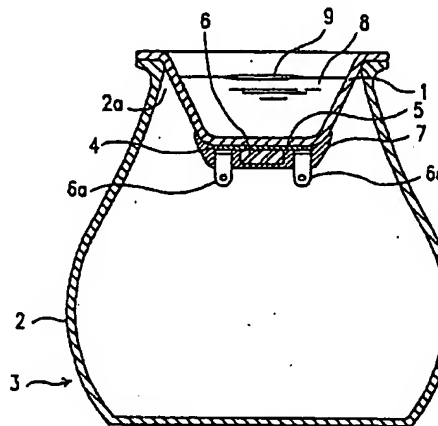
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(54) Fragrance burner body and fragrance burner

(57) The fragrance burner of this invention includes: a fragrance burner body including a bowl for receiving an aromatic material and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl; and a support disposed removably for supporting the bowl of the fragrance burner body.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION:

The present invention relates to a fragrance burner body for evaporating an aromatic oil to fill the indoor atmosphere with incense or to be used for aroma therapy, and a fragrance burner including such a fragrance burner body.

2. DESCRIPTION OF THE RELATED ART:

Figure 11 is a sectional view of a conventional fragrance burner. This fragrance burner includes a bowl 21 and a support 22 for supporting the bowl 21. The support 22 is hollow inside, and a candle 23 is put inside the support 22 through an opening formed at a portion of the support 22. An aromatic oil 25 such as an essential oil and a fragrant oil is put in the bowl 21 together with water 24 or hot water. The aromatic oil 25 evaporates by being heated with the flame of the candle 23 in the support 22, emitting incense.

Such a conventional fragrance burner which uses a candle as the heating source is disadvantageous in the following points.

Since the size of the candle to be used is restricted depending on the size of the support of the fragrance burner body, the candle burns for only several hours at longest. Also, as the candle burns, the height of the position of the wick of the candle, as well as the size of the flame, change. This makes it difficult to control the burning of the candle. The environment where the fragrance burner is placed is also restricted since the flame of the candle may burn differently or even go out if the air stream abruptly changes. Moreover, the candle needs inconvenient manual operation whenever it is lit or put out.

SUMMARY OF THE INVENTION

The fragrance burner body of this invention includes: a bowl for receiving an aromatic material; and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl.

In one embodiment of the invention, the ceramic semiconductor heater is provided with a radiation plate.

Alternatively, the fragrance burner body of this invention includes: a metal bowl for receiving an aromatic material; and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl, wherein the metal bowl serves as a radiation plate.

In one embodiment of the invention, the ceramic semiconductor heater is covered with a heat resistant material.

According to another aspect of the invention, a fra-

grance burner is provided. The fragrance burner includes: a fragrance burner body including a bowl for receiving an aromatic material and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl; and a support disposed removably for supporting the bowl of the fragrance burner body.

Alternatively, the fragrance burner of this invention includes: a fragrance burner body including a metal bowl for receiving an aromatic material and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl, the metal bowl serving as a radiation plate; and a support disposed removably for supporting the bowl of the fragrance burner body.

Alternatively, the fragrance burner of this invention includes: a bowl for receiving an aromatic material; a support disposed integrally with the bowl for supporting a periphery of the bowl; and a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating the bowl.

Alternatively, the fragrance burner of this invention includes: a bowl for receiving an aromatic material; a support on which the bowl is placed; and a ceramic semiconductor heater disposed on a top surface of the support on which the bowl is placed, for heating the bowl.

In one embodiment of the invention, the ceramic semiconductor heater is provided with a radiation plate.

In another embodiment of the invention, the ceramic semiconductor heater is covered with a heat resistant material.

In still another embodiment of the invention, an indicator lamp indicating whether or not a voltage is being applied to the ceramic semiconductor heater is disposed at a position visible externally.

The fragrance burner of this invention includes: a bowl for receiving an aromatic material; a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating; and a battery for supplying electric power to said heater.

Thus, the invention described herein makes possible the advantages of (1) providing a fragrance burner body capable of being placed in an environment which is less restrictive, being lit or put out simply and easily, and being used without time limit, and (2) providing a fragrance burner including such a fragrance burner body.

These and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a fragrance burner of Example 1 according to the present invention.

Figures 2A and 2B are perspective views illustrat-

ing the steps of attaching a PTC heater to a bowl in Example 1.

Figures 3A to 3D show the PTC heater and a radiation plate in Example 1.

Figure 4 is a graph showing the relationships between the activating time and the temperature and between the activating time and the current for the fragrance burner of Example 1.

Figure 5A is a sectional view of a fragrance burner body of Example 2 according to the present invention. Figures 5B and 5C are perspective views illustrating the steps of attaching a PTC heater to a bowl in Example 2.

Figure 6 is an exploded perspective view of a fragrance burner of Example 3 according to the present invention.

Figure 7 is a perspective view showing the appearance of the entire fragrance burner of Example 3.

Figures 8A to 8C show a fragrance burner of Example 4 according to the present invention, where Figure 8A is an exploded perspective view showing the attachment of a PTC heater covered with a heat insulating sheath to a bowl, Figure 8B is sectional view of the PTC heater covered with the heat insulating sheath, and Figure 8C is an exploded perspective view showing the attachment of the bowl with the PTC heater attached thereto to a support.

Figure 9A is an exploded perspective view of a fragrance burner of Example 5 according to the present invention. Figure 9B is a sectional view of a support of the fragrance burner of Figure 9A.

Figure 10 is a sectional view of a fragrance burner body of Example 6 according to the present invention.

Figure 11 is a sectional view of a fragrance burner of Example 7 according to the present invention.

Figure 12 is a sectional view of a conventional fragrance burner.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The fragrance burner of the present invention, which includes a censer, an incense burner, and the like, uses a heater made of a ceramic semiconductor of a PTC (positive temperature coefficient) thermistor element as the heat energy supply source (hereinafter, such a heater is referred to as a PTC heater). Using the PTC heater, optimal heating conditions for evaporating an aromatic material in a bowl of the fragrance burner can be set by selecting the Curie point of the ceramic semiconductor. With this feature of the PTC heater, the temperature of the bowl can be kept constant at an optimal temperature, allowing the aromatic material in the bowl to be evaporated stably. Even after all the aromatic material has been evaporated, the temperature of the bowl can be kept constant. Therefore, the fragrance burner using the PTC heater is safe.

Besides the candle described above in the related art, a means of burning liquid fuel by use of a wick such

as an alcohol lamp, solid fuel such as charcoal, a means of converting electricity into heat energy such as a Nichrome wire, and the like are also conventionally used as the heat energy supply source required for evaporating the aromatic material in the bowl. By any of these conventional means, however, it is difficult to continue to stably supply the small amount of heat energy required for evaporation by using a simple type of control. The cost to realize a stable supply will be high.

The PTC heater may be provided with a radiation plate which is disposed to be in contact with the bowl. With this arrangement, the heat from the PTC heater can be conducted uniformly in a wider area.

The PTC heater is preferably covered with a heat resistant resin, a heat resistant case, or the like made of a heat resistant material so that the heat of the PTC heater can be effectively conducted to the bowl.

The PTC heater provided with the radiation plate may be disposed in a support so that the radiation plate is exposed on the top surface of the support. The aromatic material in the bowl can be evaporated by placing the bowl on the radiation plate.

The radiation plate may be formed as the bowl, and the PTC heater is attached to the bottom surface of the bowl. This not only improves the heating efficiency but also reduces the number of components.

An indicator lamp showing whether or not a voltage is being applied to the terminals of the ceramic semiconductor heater is provided, so that whether or not the fragrance burner is under use can be confirmed by observing a light emitted from the indicator lamp. The user can therefore switch off the application of a voltage to the ceramic semiconductor heater if the user recognizes that the indicator lamp is lit when the user does not intend to use the fragrance burner. This saves wasteful power consumption.

The fragrance burner which includes a bowl for receiving an aromatic material, a ceramic semiconductor heater disposed on an outer bottom surface of the bowl for heating and a battery for supplying electric power to the heater, is also contained in this invention.

A primary battery for example, manganese battery, alkali-manganese battery and other kinds of dry-battery are available for the above-mentioned fragrance burner. Furthermore, a secondary battery for example, lead-sulfate battery, nickel-cadmium battery, nickel-hydrogen battery, lithium-ion battery and other kinds of re-chargeable type battery are available for the fragrance burner. Among them, a nickel-hydrogen battery and lithium-ion battery are more preferable because their efficiency of power output per volume are higher than other type of secondary batteries.

In this type of the fragrance burner, the semiconductor heater is heated by an electric power of the battery, however, it is possible to heat the heater directly only by ordinary electric source of an alternating current, without that of battery.

The bowl and the support of the fragrance burner

may be inseparably integrated or separable. These types of fragrance burners are manufactured in different ways but are not especially different from each other when used.

Hereinbelow, the present invention will be described by way of examples with reference to the accompanying drawings.

(Example 1)

Figure 1 is a sectional view of a fragrance burner of Example 1 according to the present invention. Figures 2A and 2B are perspective views illustrating the steps of attaching a PTC heater to a bowl in this example.

A fragrance burner 3 of this example includes a bowl 1 and a support 2 for supporting the periphery of the bowl 1. An aromatic material containing water 8 or hot water and an aromatic oil 9 such as an essential oil and a fragrant oil is placed in the bowl 1. The support 2 is hollow inside, and has a plurality of holes (not shown) formed through the wall thereof to ventilate the inside of the support 2. An opening 2a is formed at the top of the support 2 to receive the bottom portion of the bowl 1. The periphery of the opening 2a supports the periphery of the bowl 1.

As shown in Figures 1 and 2A, a PTC heater 6 provided with a radiation plate 5 is bonded to the bottom surface of the bowl 1 constituting the fragrance burner 3 with a silicone adhesive 4 so that the radiation plate 5 is in contact with the bottom surface of the bowl 1. More specifically, the radiation plate 5 is thinly coated with a material with good heat conduction such as silicone grease, and closely bonded to the bottom surface of the bowl 1 so that no air layer is interposed therebetween. Then, the silicone adhesive 4 is applied to the peripheral portions of the radiation plate 5 on the bottom surface of the bowl 1, and cured to fix the radiation plate 5 to the bowl 1, forming ridge-shaped adhesive portions at the peripheries of the radiation plate 5 on the bottom surface of the bowl 1. As the adhesive 4, inorganic adhesives and any other adhesives which have heat resistance and an bond strength large enough to endure actual use can be used. Alternatively, the PTC heater 6 may be mechanically attached to the bowl 1 by screwing the radiation plate 5 on the bowl 1.

The bottom surface of the bowl 1 should have a high flatness by polishing and the like to enhance the bonding between the bowl 1 and the radiation plate 5. The radiation plate 5 may be made of metal such as aluminum and copper or ceramic having high heat conduction such as alumina and beryllia. The radiation plate 5 is disposed to efficiently conduct heat generated by the PTC heater 6 to the bowl 1. The radiation plate 5 may be omitted. In such a case, a material with high heat conduction such as silicone grease as described above is preferably applied between the PTC heater 6 and the bowl 1.

After the attachment of the PTC heater 6 to the

bowl 1, the entire PTC heater 6 including the radiation plate 5 is covered with a heat resistant material 7 as shown in Figure 2b. As the heat resistant material 7, silicone RTV rubber, resin, varnish, epoxy resin, inorganic materials such as alumina cement, and the like may be used.

Two terminals 6a of the PTC heater 6 extend from the heat resistant material 7 and are connected to an end of a cord with a plug disposed at the other end. The two terminals 6a are disposed for two electrodes 6b formed on the surface of the radiation plate 5 in consideration of the position of the PTC heater 6, as shown in Figures 3B and 3D. A remote switch may be provided somewhere on the cord to facilitate the turning on/off of the PTC heater 6. Figure 3A is a side view showing the radiation plate 5 and the PTC heater 6, Figure 3B is a front view of Figure 3A, Figure 3C is a side view showing only the radiation plate 5, and Figure 3D is a front view of Figure 3C.

Figure 4 is a graph showing the relationships between the activating time (in minutes) and the temperature (°C) and between the activating time and the current for the fragrance burner of this example. Curve A represents the temperature while curve B represents the current. A PTC heater with a Curie point of 160°C was used in this measurement.

As is observed from Figure 4, the temperature of the aromatic material in the bowl was kept constant in the range of 60 to 63°C after the heater was activated. The power consumption during this constant temperature was as small as about 15 W. This is economically advantageous.

A voltage of 200 V or 100 V may be applied to the fragrance burner of Example 1. An indicator lamp showing the status of the voltage applied to the ceramic semiconductor heater is preferably disposed on the support 2. The bowl 2 is preferably removable from the support 2 so that it can be cleaned.

(Example 2)

Figure 5A is a sectional view of a fragrance burner body of Example 2 according to the present invention. Figures 5B and 5C are perspective views illustrating the steps of attaching a PTC heater to a bowl. The same components as those shown in Figure 1 are denoted by the same reference numerals.

In this example, a PTC heater 16 is covered with a heat insulating sheath 17. Terminals 16a extend from the sheath 17. The terminals 16a also extend from a heat resistant material 7 when the PTC heater 16 is further covered with the heat resistant material 7 as shown in Figure 5C. The exposed terminals 16a are connected to an end of a cord as in Example 1.

The fragrance burner body of this example with the above structure may be placed on a support which supports the periphery of the bowl 1, to serve as a fragrance burner.

Such a support is preferably a pot-shaped vessel having a hollow inside configured to receive the bowl 1 except for the periphery thereof so that the heat insulating sheath 17 covering the PTC heater 16 is invisible from outside of the support.

Alternatively, the inner bottom of the bowl 1 may be raised, and the PTC heater 16 may be disposed in the space formed by the raised bottom so that the heat insulating sheath 17 covering the PTC heater 16 is invisible externally. With this structure, no support is necessary, or legs and the like may be attached to the bowl 1.

A voltage of 200 V or 100 V may be applied to the fragrance burner body of Example 2. An indicator lamp showing the status of the voltage applied to the ceramic semiconductor heater is preferably disposed on the bowl.

(Example 3)

Figure 6 is an exploded perspective view of a fragrance burner of Example 3 according to the present invention, showing a bowl 1 and a support 2 separately.

In this example, a PTC heater covered with a heat insulating sheath as in Example 2 is attached to a radiation plate, and the radiation plate is bonded to the bottom surface of the bowl 1 as described in Example 1. A heat resistant material 7 covers the heat insulating sheath. In the fragrance burner of this example, an indicator lamp 10 for indicating that the PTC heater is in the state of being applied with a voltage (ON state) is disposed on the heat resistant material 7. The indicator lamp 10 does not respond to the automatic on/off operation by the PTC heater itself serving as a thermistor, but lights up only when a remote switch 12 disposed somewhere on a cord 11 extending through a hole 2c of a support 2 is turned on. More specifically, the indicator lamp 10 includes a tinted neon bulb, to which a voltage is applied via a wire extending from a terminal (not shown) of the PTC heater directly or from a portion adjacent to the terminal. A resistor may be disposed on the wire if necessary for the lighting of the neon bulb.

A pair of pin connectors 14 are disposed at one end of a cord 13 the other end of which is connected to the terminal (not shown) of the PTC heater and at one end of the cord 11 on the side of the PTC heater. The pair of pin connectors 14 are connected together, and a plug 15 disposed at the other end of the cord 11 is connected to a home outlet (e.g., 100V or 200 V) to allow a voltage to be applied to the PTC heater. The PTC heater can be turned on/off with the remote switch 12 on the cord 11 while the plug 15 is kept connected to the home outlet. A fuse 19 is disposed on the cord 13 to discontinue a current flow if an abnormality arises.

An opening 2b is formed at an appropriate position of the support 2 to allow light emitted from the indicator lamp 8 to be visible externally when the bowl 1 is placed in the support 2 through an opening 2a with the periph-

ery of the bowl 1 being supported on the periphery of the support 2. Thus, the user can confirm that the remote switch 12 is in the ON state by observing the lighting of the indicator lamp 10 via the opening 2b. The ON state of the remote switch 12 also means that the fragrance burner, i.e., the heater, is under heating. Figure 7 is a perspective view of the entire fragrance burner of this example.

The surface of the fragrance burner 3 composed of the bowl 1 and the support 2 may be patterned with a plurality of colors to enhance the appearance. The bowl 1 is removably placed on the support 2.

(Example 4)

A fragrance burner of Example 4 will be described with reference to Figures 8A to 8C. Figure 8A is an exploded perspective view illustrating the attachment of a PTC heater covered with a heat insulating sheath to a bowl. Figure 8B is a sectional view of the PTC heater covered with the heat insulating sheath. Figure 8C is an exploded perspective view illustrating the attachment of the bowl with the PTC heater attached thereto to a support.

As shown in Figures 8A and 8B, a PTC heater 16 is bonded to a disk-shaped radiation plate 5. The bonding of the PTC heater 16 to the radiation plate 5 is further secured by a press member 18 disposed between the PTC heater 16 and a heat insulating sheath 17 made of heat resistant plastic and the like. The press member 18 includes a bent element 18a formed by bending a comparatively flexible material into a C shape and a spring 18b extending between the two ends of the bent element 18a. The heat insulating sheath 17 has a hole 17a for allowing a cord 13 to extend therethrough. A voltage is applied to the PTC heater 16 through the cord 13. The voltage applied to the PTC heater 16 may be 200 V or 100 V.

A bowl 1 with the PTC heater 16 attached thereto is placed in a support 2 through an opening 2a with the periphery of the bowl 1 being supported on the periphery of the support 2, as shown in Figure 8C. An indicator lamp 10 is disposed on the circumferential surface of the support 2 so that the ON state of the PTC heater 16 can be confirmed externally as in Example 3. In this example, the indicator lamp 10 is connected to the PTC heater 16 via a cord with an appropriate length, and a voltage applied to the PTC heater 16 is applied to the indicator lamp 10. The inner depth of the support 2 is comparatively small, and is substantially the total of the height of the heat insulating sheath 17 and the height of the bowl 1, i.e., the distance between the bottom of the periphery and the bottom surface of the bowl 1. Such a low support 2 is possible because the PTC heater 16 is used instead of a candle. Therefore, the height of the entire fragrance burner can be lowered to a level which has not been conventionally achieved.

(Example 5)

Figure 9A is an exploded perspective view of a fragrance burner of Example 5, and Figure 9B is a sectional view of a support of the fragrance burner of this example. In this example, a radiation plate 5 and a PTC heater 16 are disposed in a support 2, and a bowl 1 is placed on the support 2.

More specifically, the periphery of the radiation plate 5 is seated on the periphery of an opening 2a of the support 2 to fix the radiation plate 5 on the support 2. The PTC heater 16 is bonded to the radiation plate 5 fixed to the support 2. A spring 18b is disposed between the PTC heater 16 and a heat insulating sheath 17 fixed to the radiation plate 5 in a state of incomplete expansion. A cord 11 with a remote switch 12 disposed thereon is connected to the PTC heater 16. The other configuration is the same as that of Example 4. An indicator lamp 10 is disposed on the support 2. The indicator lamp 10 lights up when the remote switch 12 is in the ON state and goes out when it is in the OFF state.

Thus, according to the fragrance burner of this example, the bowl 1 can be heated by placing the bowl 1 on the top surface of the support 2 where the radiation plate 5 is exposed.

A voltage of 200 V or 100 V may be applied to the PTC heater 16.

(Example 6)

Figure 10 is a sectional view of a fragrance burner body of Example 6 according to the present invention.

The fragrance burner component of this example includes a bowl 1 made of metal which can serve as the radiation plate. A PTC heater 16 covered with a heat insulating sheath 17 is bonded to the bottom surface of the bowl 1. A spring 18b is disposed between the PTC heater 16 and the heat insulating sheath 17. The heat insulating sheath 17 is fixed to the metal bowl 1 by screwing, to ensure the fixation of the PTC heater 16 on the bottom surface of the bowl 1. A voltage of 200 V or 100 V may be applied to the PTC heater 16.

The fragrance burner body of this example can be placed in an appropriate support through an opening, with the periphery of the fragrance burner body being supported on the periphery of the support, to complete a fragrance burner. The user can select a support with a desirable shape and appearance according to the preference of the user, to complete his or her own unique fragrance burner.

Using the fragrance burner body of this example, the heat of the PTC heater 16 can be directly conducted to the metal bowl where an aromatic material is placed. This provides a higher heating efficiency than those obtained in the above examples, reducing power consumption.

(Example 7)

Figure 11 is a sectional view of a fragrance burner of Example 7 according to the present invention.

The fragrance burner component of this example includes a bowl 1 made of metal which can serve as the radiation plate. A PTC heater 16 covered with a heat insulating sheath 17, is bonded to the bottom surface of the bowl 1. A spring 18B is disposed between the PTC heater 16 and the heat insulating sheath 17. The heat insulating sheath 17 is fixed to the metal bowl 1 by screwing, to ensure the fixation of the PTC heater 16 on the bottom surface of the bowl 1.

Sometimes, a thin mica plate is used in stead of a metal bowl and a tip of a fragrant wood is put directly on the mica plate.

A lithium ion battery 20 is equipped inside the support or case of the bowl 1 and leading terminals of the battery are connected with these of the PTC heater 16 through switch and other additional devices. Which electric source of the battery or an ordinary alternating current is available depend on the case. the lithium ion battery sometimes contains a voltage adjustment device in it.

Thus, according to the present invention, by using the PTC heater as the heating source, the temperature of the content in the bowl can be kept constant, and the optimal conditions for stably evaporating water containing an aromatic oil in the bowl can be maintained. Moreover, according to the fragrance burner of the present invention, the environment where the fragrance burner is placed is less restrictive. The fragrance burner can be simply and easily lit or put out, and can be used without time limit. Any temperature required for the evaporation of a content in the bowl can be set by selecting the Curie point of the PTC heater.

Various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be broadly construed.

Claims

1. A fragrance burner body comprising:

a bowl (1) for receiving an aromatic material (9); and
a ceramic semiconductor heater (6; 16) disposed on an outer bottom surface of the bowl (1) for heating the bowl (1).

2. A fragrance burner body according to claim 1, wherein the bowl is a metal bowl (1) and wherein the metal bowl (1) serves as a radiation plate.

3. A fragrance burner comprising:

a fragrance burner body including a bowl (1) for receiving an aromatic material (9) and a ceramic semiconductor heater (6; 16) disposed on an outer bottom surface of the bowl (1) for heating the bowl; and
a support (2) disposed removably for supporting the bowl (1) of the fragrance burner body.

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4. A fragrance burner according to claim 3, wherein the bowl (1) is the metal bowl, the metal bowl serving as a radiation plate.

5. A fragrance burner comprising:

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a bowl (1) for receiving an aromatic material (9);
a support (2) disposed integrally with the bowl (1) for supporting a periphery of the bowl (1);
and
a ceramic semiconductor heater (6; 16) disposed on an outer bottom surface of the bowl (1) for heating the bowl (1).

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6. A fragrance burner comprising:

a bowl (1) for receiving an aromatic material (9);
a support (2) on which the bowl (1) is placed;
and
a ceramic semiconductor heater (6; 16) disposed on a top surface of the support (2) on which the bowl (1) is placed, for heating the bowl (1).

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7. A fragrance burner according to any of the preceding claims, wherein the ceramic semiconductor heater (6; 16) is provided with a radiation plate (5).

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8. A fragrance burner according to any of the preceding claims, wherein the ceramic semiconductor heater (6; 16) is covered with a heat resistant material (7).

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9. A fragrance burner according to any of the preceding claims, wherein an indicator lamp (10) indicating whether or not a voltage is being applied to the ceramic semiconductor heater (6; 16) is disposed at a position visible externally.

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10. A fragrance burner according to any of the preceding claims comprising a battery (20) for supplying electric power to said heater.

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FIG. 1

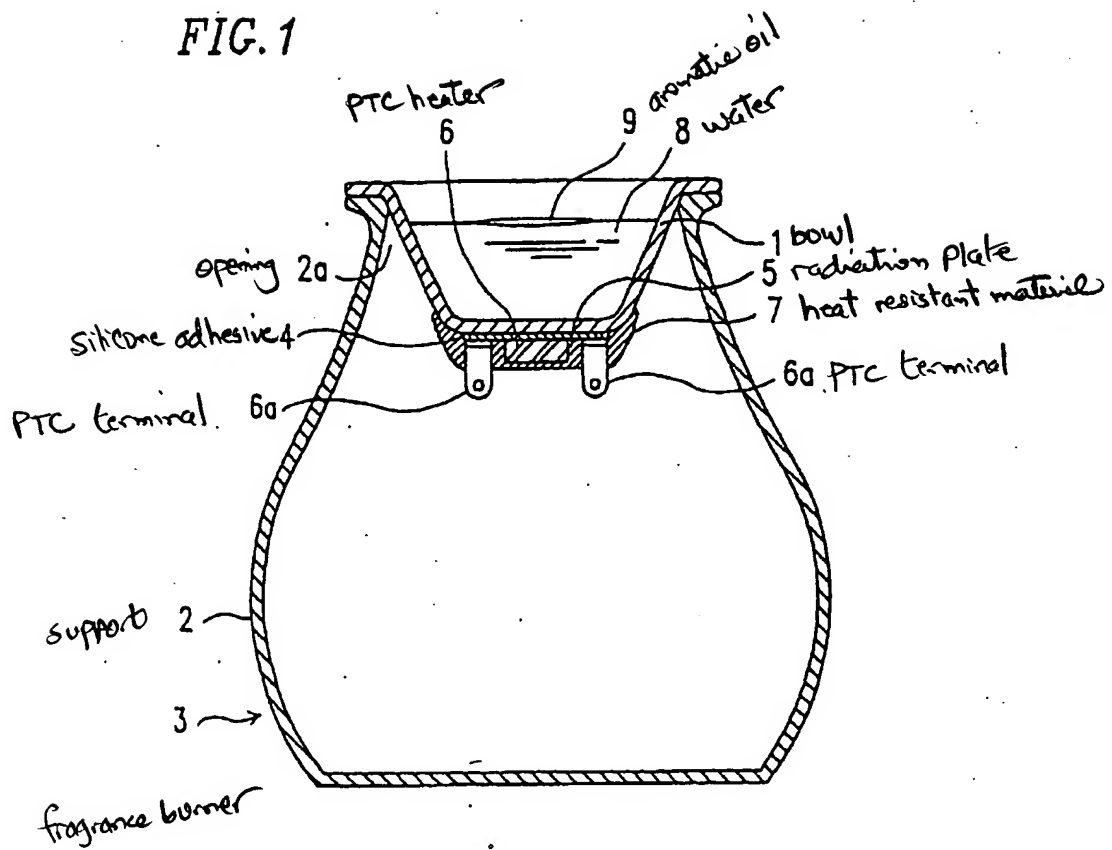


FIG. 2A

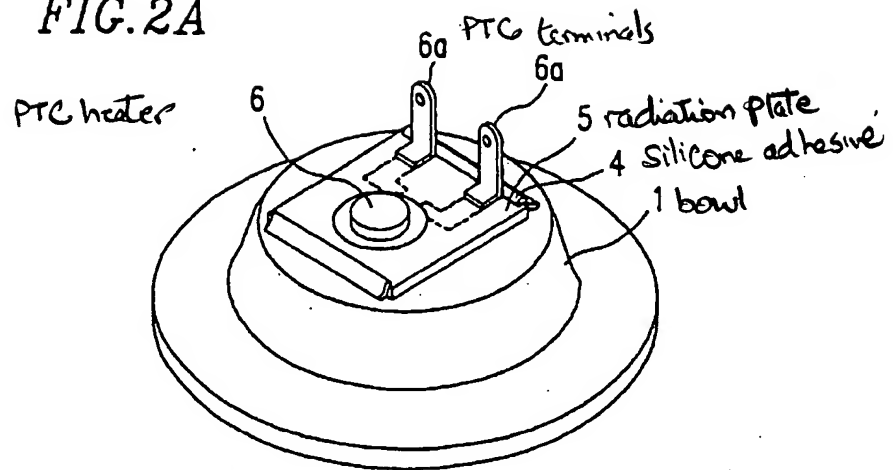


FIG. 2B

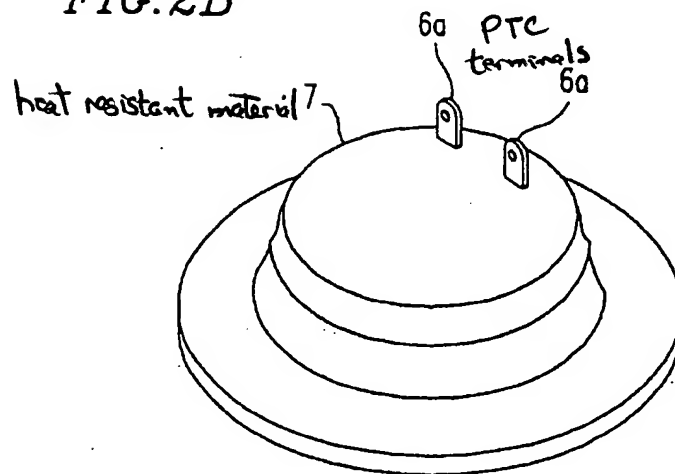


FIG. 3A

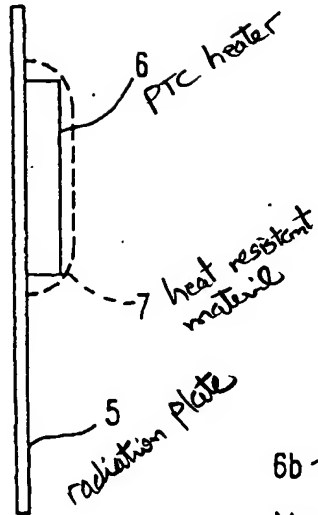


FIG. 3B

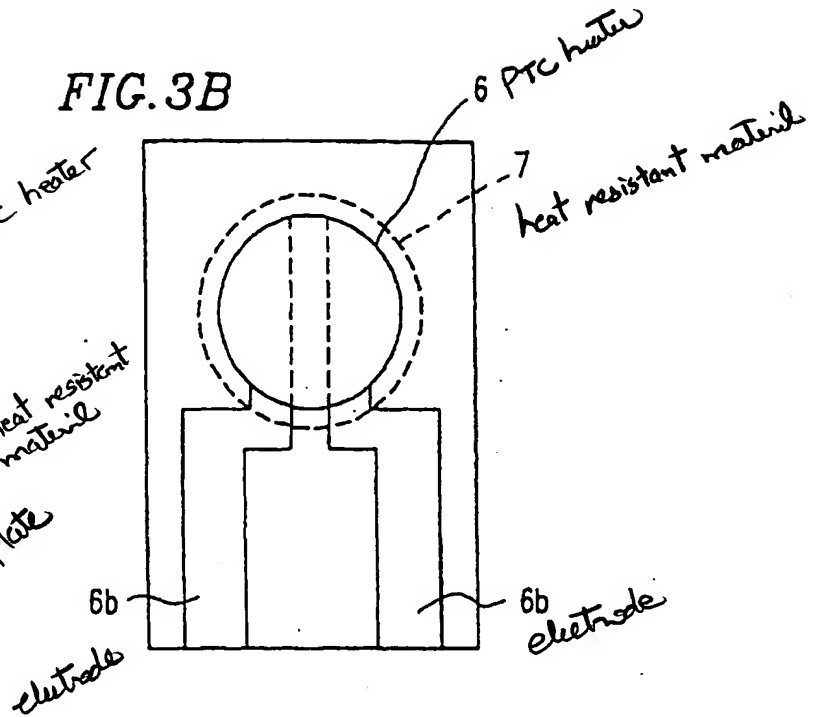


FIG. 3C

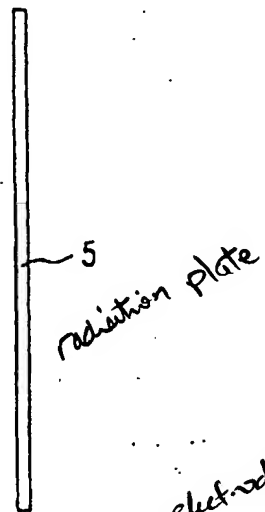


FIG. 3D

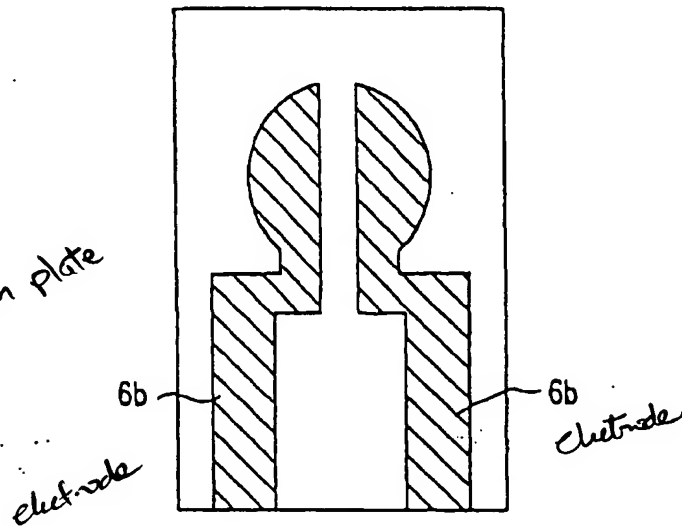


FIG. 4

Characteristics data of heater for fragrance burner

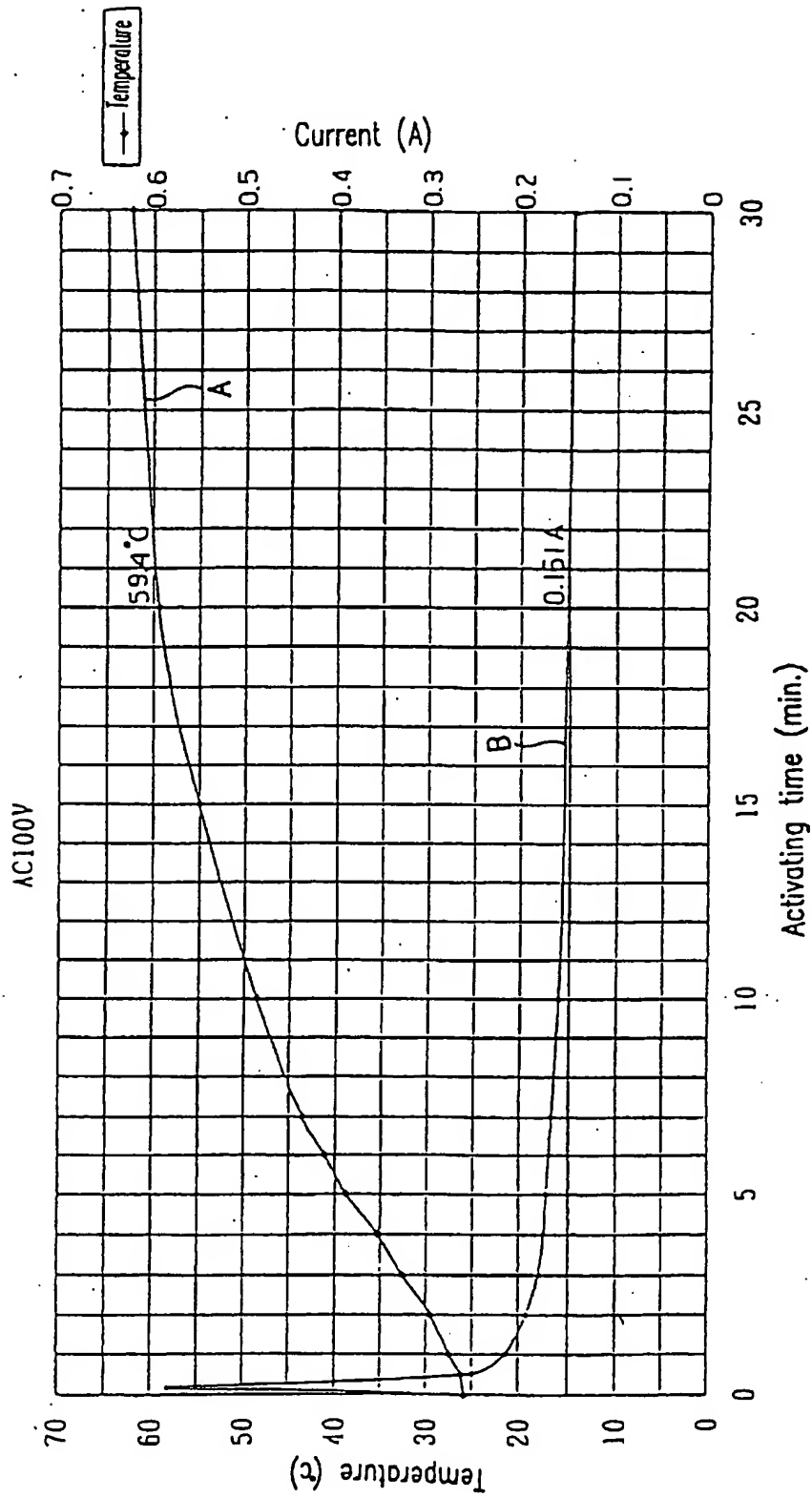


FIG. 5A

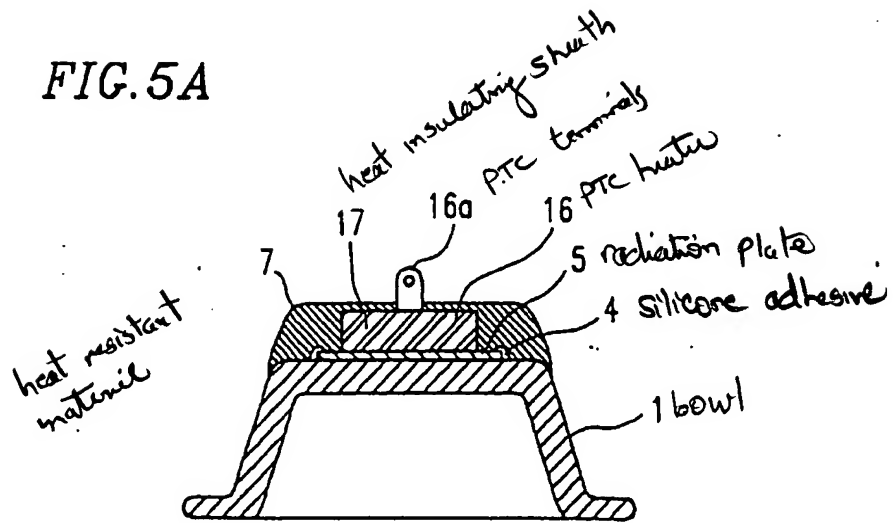


FIG. 5B

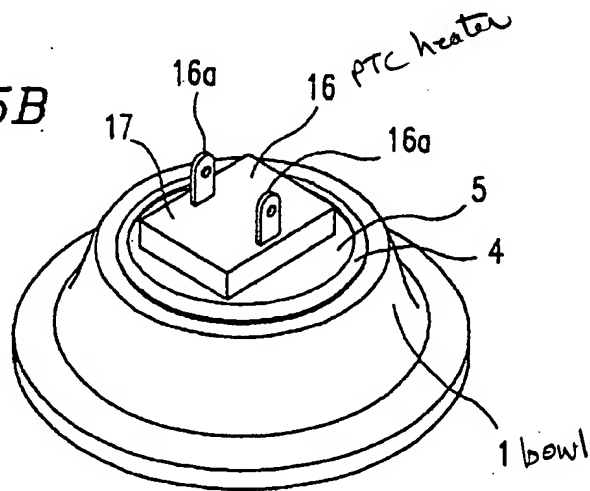


FIG. 5C

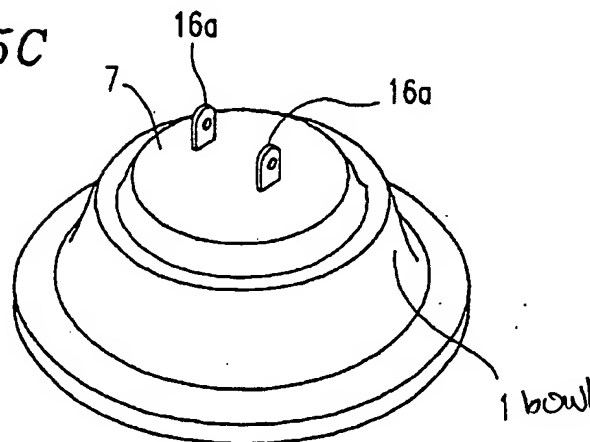


FIG. 6

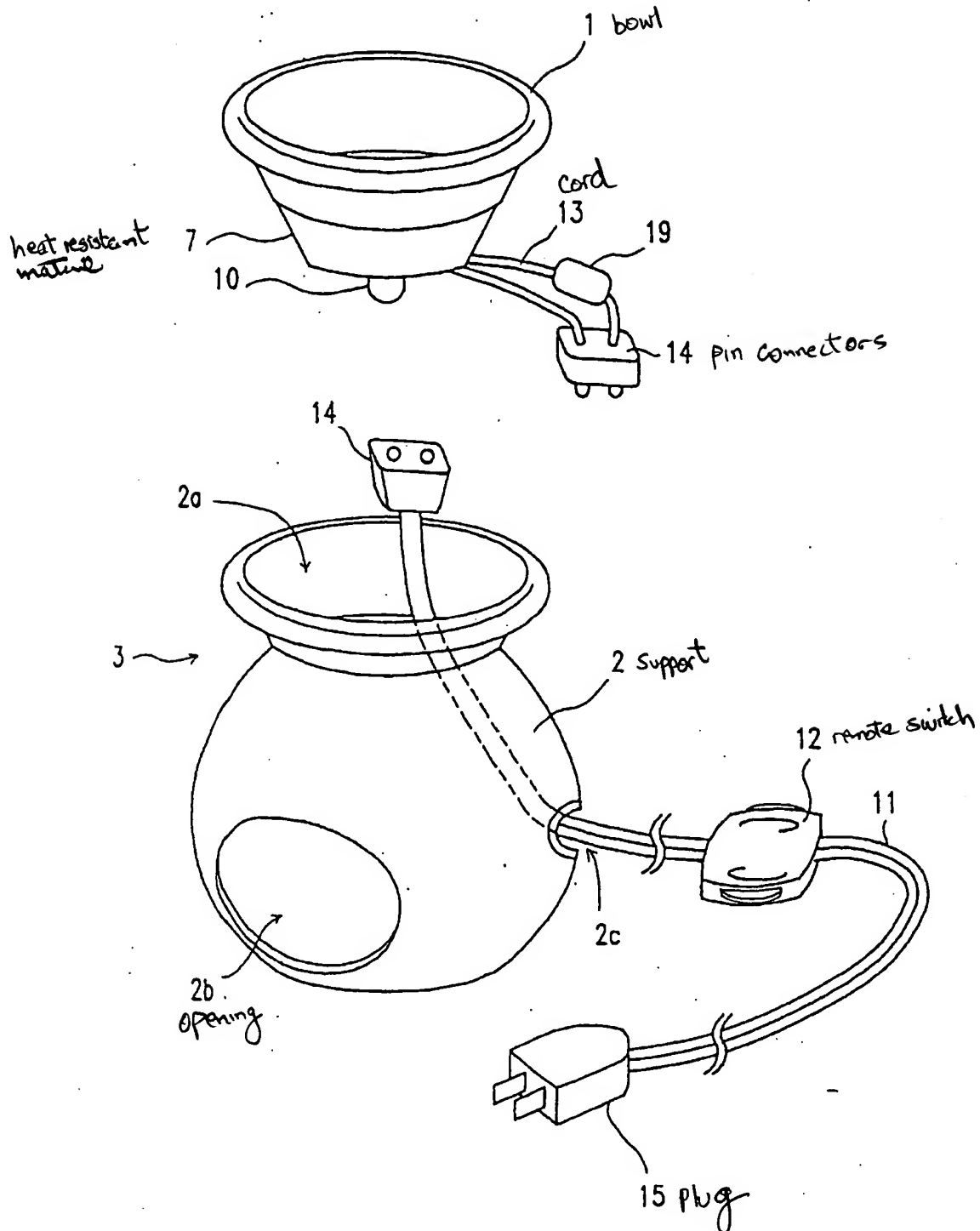


FIG. 7

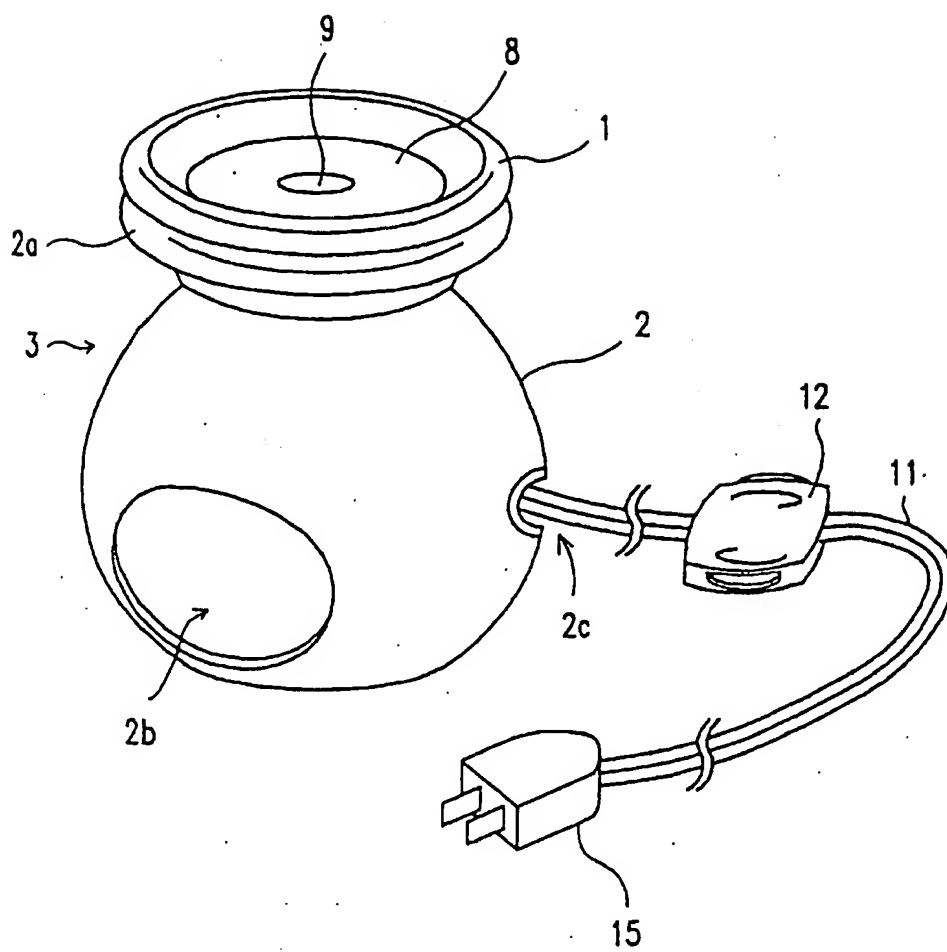


FIG. 8A

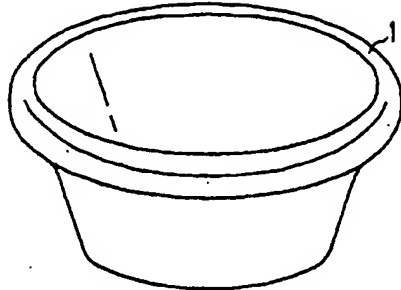


FIG. 8B

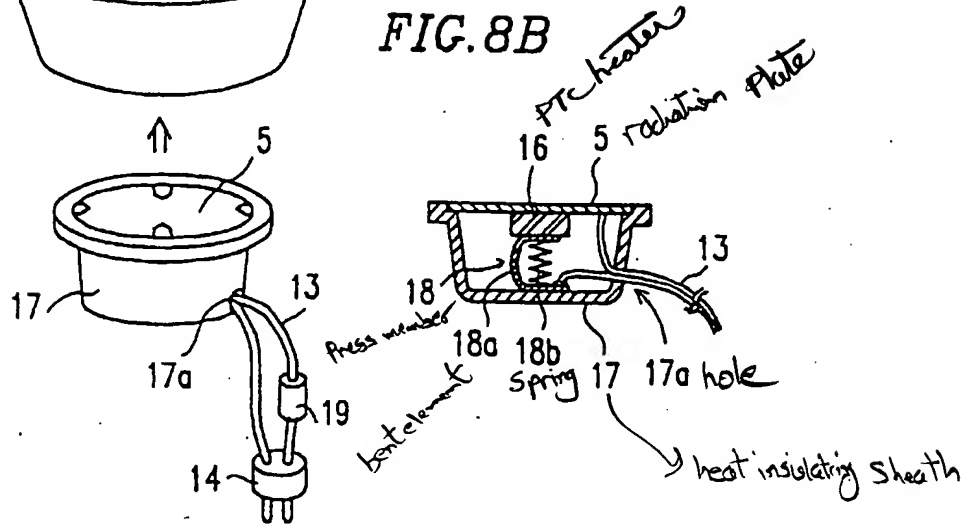


FIG. 8C

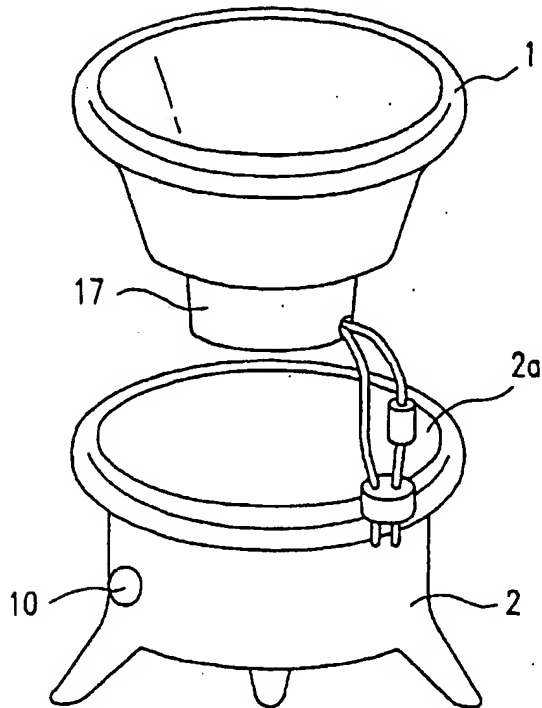


FIG. 9A

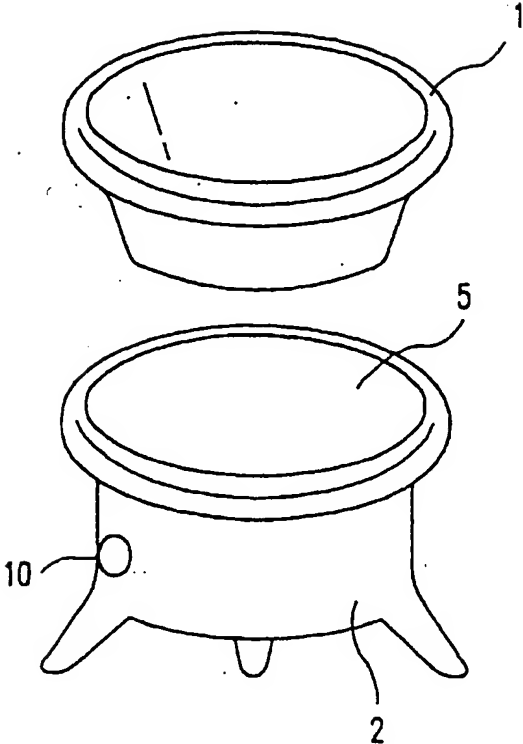


FIG. 9B

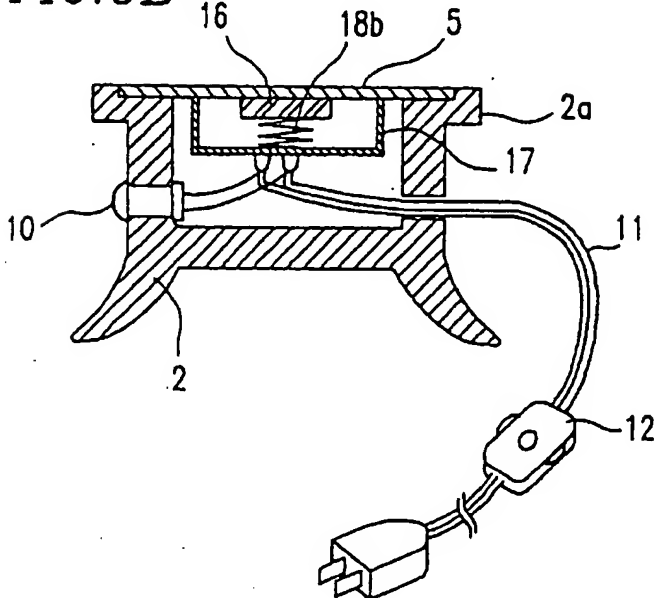
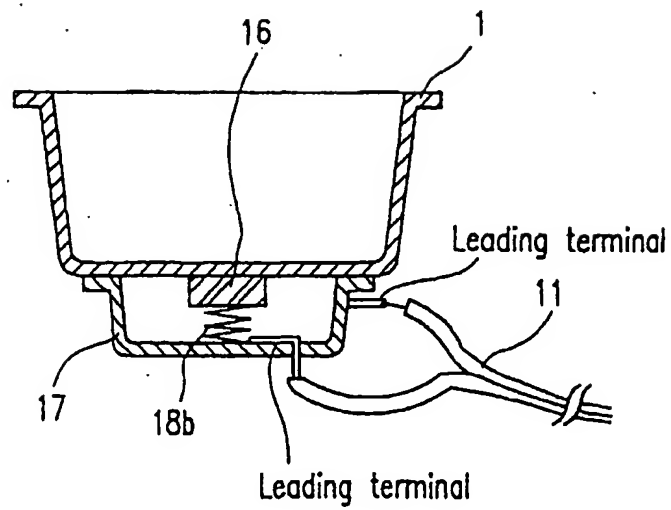


FIG. 10



~~Prior Art~~

FIG. 11

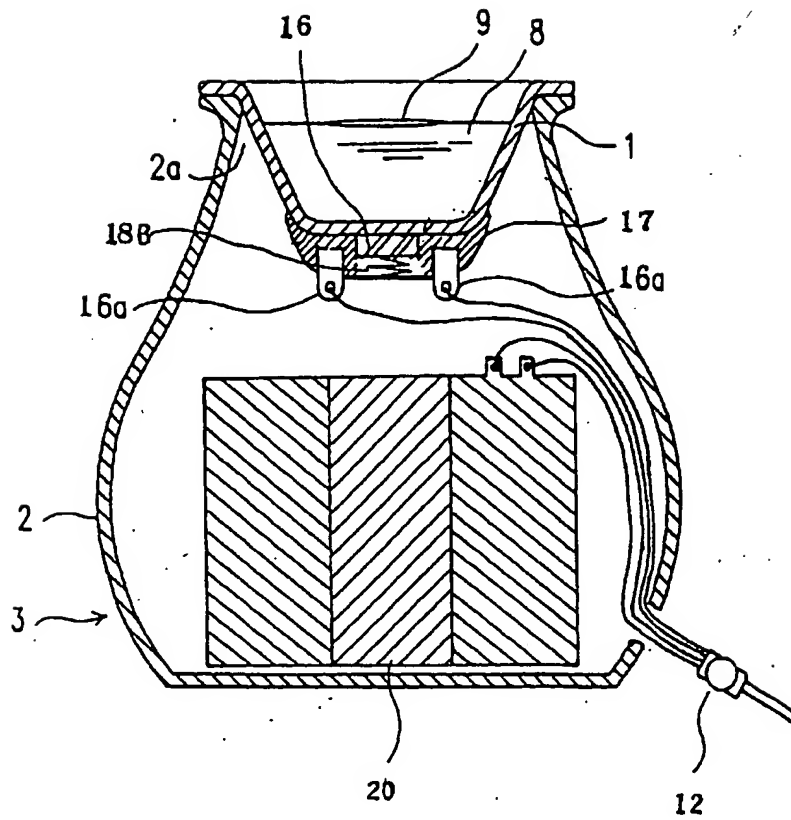
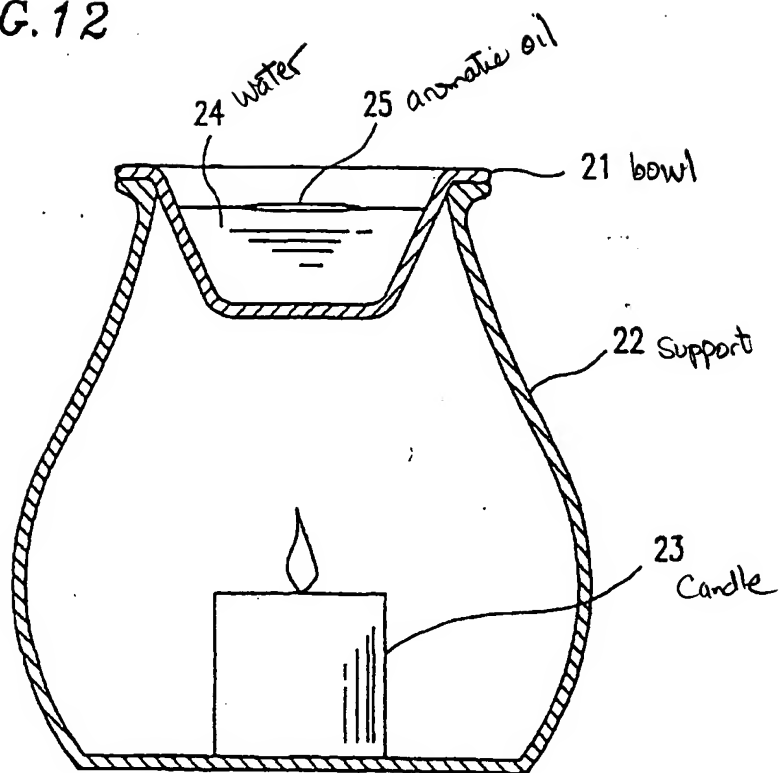


FIG. 12





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